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ABSTRACT

The methodology employed in an analysis of expenditures on academic programs at McMaster University is presented. The general procedure was to provide expenditure data for instruction programs, research programs, and professional activities/public service programs. The results are aggregated to give expenditures per student by program and year (stage) for instructional programs, and expenditures by department for research and professional activities/public service. One of the main considerations of this analysis is the measurement of the distribution of faculty activity. Two aspects of program expenditure analysis are included: a focus on outputs, and allocation of full expenditures. Program expenditures are calculated by allocating all university operating expenditures (excluding those applicable to health sciences, divinity, and nondegree extension) to output in instructional programs on a per student basis and to research and professional activities/public service on a departmental basis. Implicit in this approach is the assumption that a logical crossover can be made for all expenditures from the university's accounting system to the program categories presented. (LBH)

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METHODOLOGY FOR EXPENDITURE ANALYSIS

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METHODOLOGY FOR EXPENDITURE ANALYSIS

Introduction

The following paper presents an outline of the methodology to be employed in an analysis of expenditures on academic programs at McMaster University. The original proposal for such an analysis came from Dr. Bourns at a university planning and management systems meeting on June 20, 1972. Since then, a Steering Committee has been appointed under the Chairmanship of Dr. McCalla to provide overall guidance for the project. Dr. Higbee and his staff have been asked to work out a detailed methodology for the task and perform the staff work for the study.

The proposed general approach to the expenditure analysis was outlined in a paper by Dr. McCalla, which was approved, with modifications by the Steering Committee on November 13, 1972. This paper presents the specific methodology for conducting the analysis within the guidelines set by the Steering Committee. The general procedure will be to measure and assign direct expenditures to instruction programs, research programs and professional activities/public service programs where possible, (see Appendix A for definitions of programs) and to distribute other expenditures among programs on the basis of appropriate factors--e.g., square feet of space utilized, etc.

The purpose of the study is to provide expenditure data for instruction programs, research programs, and professional activities/public service programs. Therefore the results of the analysis will be aggregated to give expenditures per student by program and year (stage) for instructional programs and expenditures by department for research and professional activities/public service.

One of the main considerations of this analysis is the measurement of the distribution of faculty activity. The question of the classification of faculty activities was covered at some length in Dr. McCalla's paper. Similar studies on faculty activity undertaken in several universities were considered and a decision made to obtain the data through departmental chairmen. This procedure was

utilized at the University of Calgary in its initial study. Teams made up of Dr. Dawson, Dr. Higbee, the Executive Assistant to the Vice-President, and Faculty Dean of each Division and Faculty will meet with chairmen to explain the purpose of the study and outline the procedures to be followed.

The methodology presented in this paper has been prepared to define the areas under consideration; explain the assumptions and limitations inherent in such a study; and describe the procedures to be used in data collection and analysis.

Assumptions and Limitations

This section discusses those assumptions and limitations that underlie the entire study. Specific assumptions and limitations regarding definitions, methodology, etc. are discussed under the appropriate section.

Program Expenditures vs. Expenditures by Budget Category (Fund Accounting)

One of the major reasons for conducting the study described here is to estimate resource expenditures by program as opposed to expenditures by fund (i.e., account category, e.g., salaries, supplies, etc.). Analysis of resource expenditures by program (program expenditure analysis) is not a new activity in complex organizations. Industry and related agencies (e.g. architectural consultants) have been doing what amounts to program costing for years. However analysis of expenditures by programs is a recent development in public sector service organizations and even more recent in Higher Education.[1]

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[1]The term "cost analysis" is frequently used. However, as the Lapp Study indicated in the university context it is a misnomer. Universities generally budget to spend all of their income without reference to standard costs or cost benchmarks.

As a result of the guidelines established by the Steering Committee, this study will include two aspects of program expenditure analysis:

1. A focus on outputs
2. Allocation of full expenditures

The Draft Proposal..., October, 1972, dealt with the topic of output measures and established the principles for allocating full operating expenditures to University programs. The procedures outlined in this paper proceed from the rationale set out in the Draft Proposal...

Therefore program expenditures will be calculated by allocating all University operating expenditures (excluding those applicable to Health Sciences, Divinity, and non-degree extension) to output in instructional programs on a per student basis and to research and professional activities/public service on a departmental basis.

Implicit in this approach is the assumption that a logical crossover can be made for all expenditures from the University's accounting system to the program categories presented herein. Such an approach involves numerous assumptions about the appropriate unit of measure for allocating a specific item. For example, should utility expenditures be allocated to a particular program on the basis of the square feet of floor space involved or the number of persons involved? Taken together the assumptions about many such items impose limitations on the utility of the data developed by this analysis. Therefore the results of the study should be interpreted in light of the difficulties inherent in crossing over a traditional fund accounting system to a program-based system in a labour-intensive organization. Thus the data should be viewed as having order of magnitude validity not dollar and cent precision.

Other Limitations

In addition to the difficulties (briefly mentioned above) involved in attempting to answer the question, "what resources are being absorbed by a given program?", two other major limitations constrain the interpretation or results of a program expenditure analysis.

1. Assessment of the present efficiency of resource utilization. The present pattern of resource utilization is the result of a myriad of interrelated decisions. Therefore this study is based on the assumption that what has been, has been, with no attempt at evaluation of the effectiveness of the present pattern of program expenditures.

2. Changes in expenditures due to trends over time and changes in volume of activity. These factors must be studied if program expenditure analysis is to be useful in long term university program planning. However, this study is the first of its kind at McMaster. Therefore, it leaves the issues of trend and volume analysis for future studies.

Methodology

The financial data to be used in the Expenditure Analysis will be the 1972/73 final budget. The budget contains estimates for a full twelve-month operating cycle and reflects the results of recent "belt-tightening" decisions required by the operating income constraints and by government policy and levelling enrolments. Assuming that the University is able to operate within this budget (without numerous significant variances), the expenditure data will provide more meaningful results than those to be obtained by using the ten-month actual expenditures of the shortened 1971/72 fiscal year. The enrolment data will be that submitted to MCU in December 1972. Other required data (e.g., staff data) also will be taken as at December 1972.

The various operations of the University can be categorized into three general groupings: academic departments, general university support departments and research projects. Each grouping will require its own set of allocation rules for arriving at final program expenditures.

The discussion and schematic illustrations which follow, set out the steps (and their sequence) that will be utilized in the study.

A PERSON DESIRING TO GAIN AN OVERVIEW OF THE STUDY CAN DO SO WITHOUT READING THE FOLLOWING NARRATIVE SIMPLY BY REVIEWING THE SCHEMATIC DIAGRAMS. EVEN IF ONE WANTS TO OBTAIN A FULL VIEW OF THE STUDY BY READING THE NARRATIVE, A PRELIMINARY REVIEW OF THE DIAGRAMS MAY FACILITATE COMPREHENSION OF THE PROCEDURAL INTERRELATIONSHIPS.

Phase I: University Activity Analysis: identify University activities and determine the extent to which departments participate

The Steering Committee for the Expenditure Analysis has identified eight activity-cost-centres to be used in calculating the individual program expenditures. These are as follows:

Instruction (including Instruction and Supervision of Graduate Students and Post-Doctoral Fellows)
Professional Activities and Public Service
Research
Administration
Library Services
Student Related Services
Ancillary Services
Operations and Maintenance

Figure I also includes an activity-cost centre called Academic Support Services. The activities in this centre are those whose expenditures can and are later distributed to the primary activities listed earlier. It is shown as an item in the Phase I diagram to assist only in obtaining a clear overview of the University operation.

The activity-cost-centres are defined as follows:

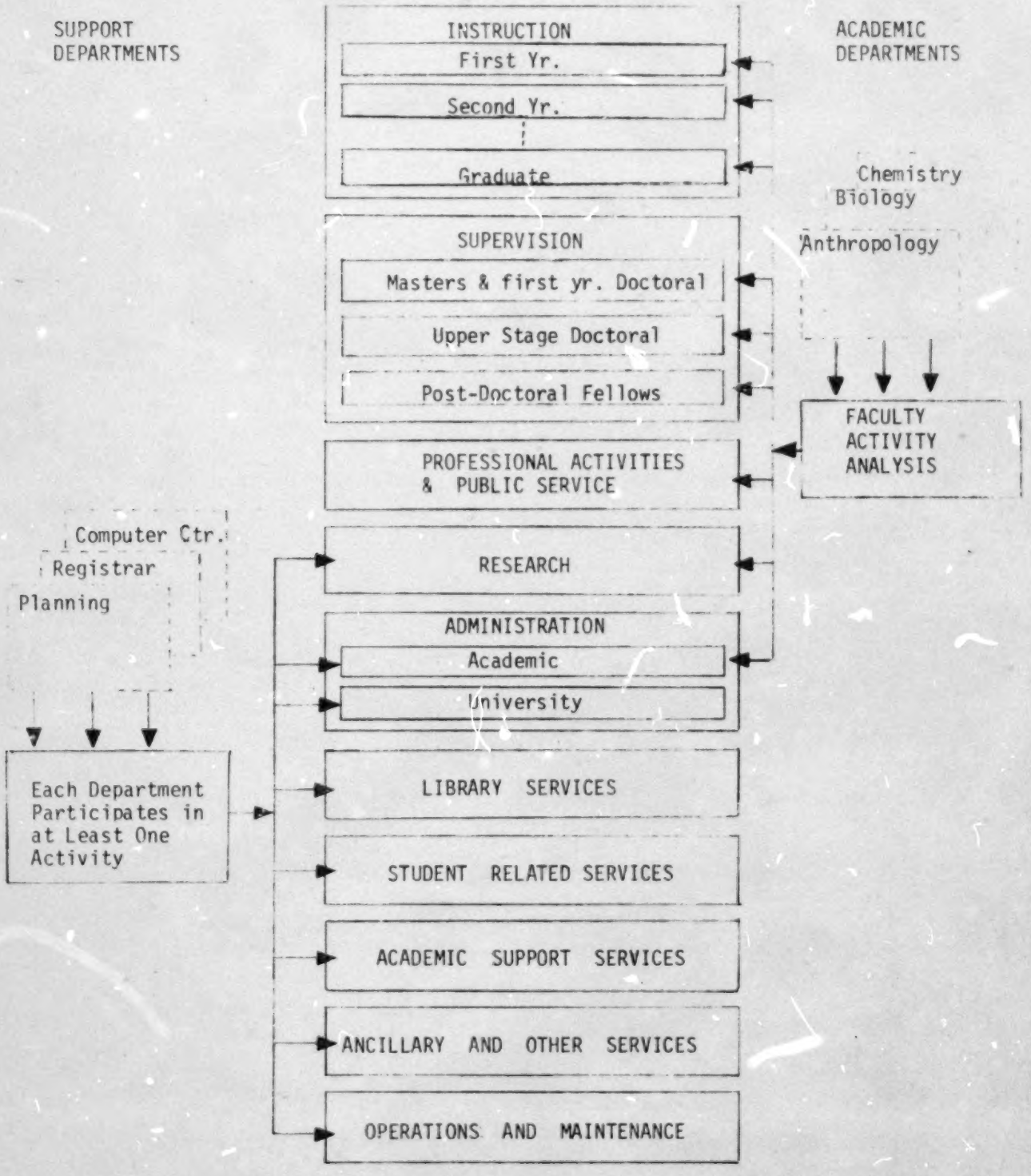
Instruction. --Instruction consists of two sub-categories which, taken together, reflect the direct "teaching" activity of the University:

(a) Instruction is the total activity concerned with the imparting of knowledge through all forms of teaching activity. It includes the preparation of lectures,

FIGURE 1

PHASE I: UNIVERSITY ACTIVITY ANALYSIS

To identify University Activities and determine the extent to which departments participate



demonstrations, seminars, and laboratory experiments, including reading for this purpose and work with assistants. It also includes interaction with students in the form of direction, academic counselling and special assistance inasmuch as these services pertain to course work. Course related activities such as preparation and grading of examinations, term papers, essays, etc. are included as part of Instruction.

(b) Supervision of graduate students and post-doctoral fellows consists of all activities that provide direction and assistance in theses and research work. It includes reading and evaluating of theses and sitting on supervisory and examination committees.

Professional Activities and Public Service. --Professional activities are defined as those activities related to inter-university, academic and professional organizations (regional, national, international). It includes work on committees of learned societies, editorial and review work for academic and professional journals, attendance at professional meetings, etc.

Research. --Research is broadly defined to include all those activities in which the University is engaged that may be described as scholarly investigation, experimentation, or creative work. It includes the planning, coordination, and execution of one's personal research projects and the preparation of related materials and all presentations of results.

Administration. --Administration is the planning, organizing, and directing functions performed which result in the formulation of policy and decision-making and the implementation of decisions. It is defined to include two levels--academic administration and university administration. Academic administration refers to those administration functions that relate directly to departments, Faculties, Senate, etc. (e.g., staff recruitment, class scheduling, Faculty councils, etc.) and offices that relate directly to instruction and research activities (see Appendix B). University administration refers to those administrative functions and offices that relate to the University as a whole--e.g., President's Office, Personnel Department, etc. (see Appendix B).

Library Services. --This category includes all activities undertaken by the Mills Memorial Library and the Science and Engineering Library in fulfilling their roles as academic resource centres.

Student Related Services. --This category includes all those activities provided by the University to assist students in facing the variety of personal problems related to campus life. It includes artistic, social and medical services.

Ancillary and Other Services. --Those activities not directly related to the academic functions of the University are included in this category. Residences and Food Service operations are examples of these kinds of activities.

Operations and Maintenance. --This category includes those activities primarily related to the maintenance and operation of the University's physical facilities and includes building maintenance, utilities, custodial expenses, etc.

Academic Support Services. --This category consists of support activities which provide direct assistance to other activities of the University, such as Instruction, Research, etc. It encompasses three departments--Audio-Visual, Computer Centre and Health Physics, whose expenditures will be distributed to the primary activities that they support.

Note: Phase I merely identifies and defines university activities and assigns non-academic departments to these activities. It does not set forth any allocation procedures. They are set forth in Phases II and III.

Phase II: Synthesis of Expenditures on Activities--Step 1: To assign departmental direct expenditures to their related activities

All support departments within the University are assigned to one of the activity-cost-centres identified in Phase I. (See Appendix B). The operating expenditure budgets for these support departments are accumulated in the appropriate activity-cost-centres prior to distribution to related Support Activities and Academic Departments by the various means described under Phase II--Step 2.

PHASE II: SYNTHESIS OF EXPENDITURES ON ACTIVITIES

STEP 1: To assign departmental direct expenses to their related activities

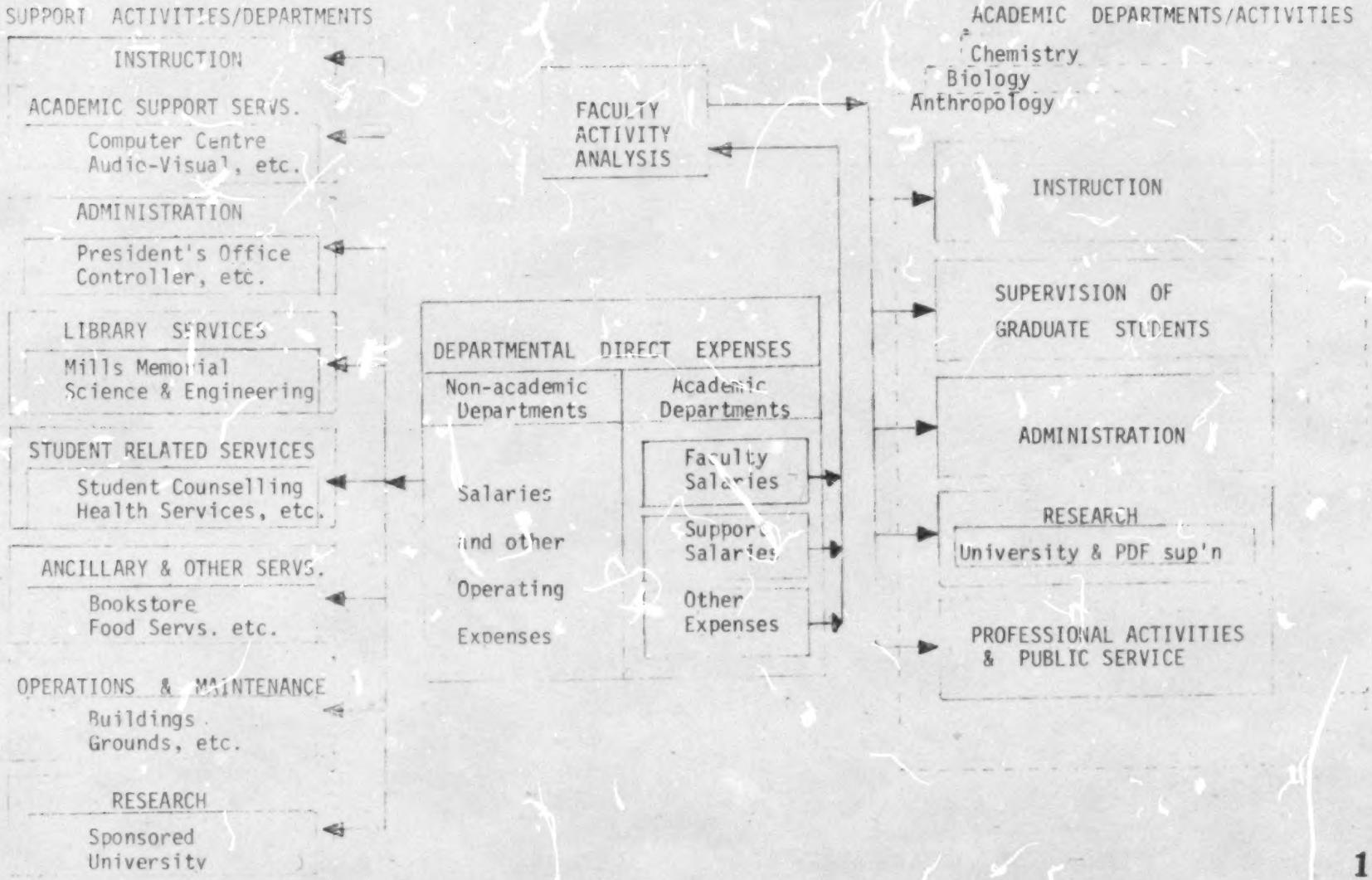


FIGURE 2

In Step 1 direct expenditures for salaries and other items (supplies, sundries, etc.) will be allocated to the activities associated with each department. The basis for allocating academic department expenditures will be the distribution of faculty activities obtained from that department. (See Appendix C for the procedure used to obtain these data. The basis for allocating the non-academic department expenditures will be a full assignment of expenditures in a given department to its related activity (see Appendix B). In this latter case if special provisions exist for splitting a department's expenditures between two or more activities, such provisions will be used. As stated earlier in the study, departments in the Division of Health Sciences and in Divinity College will not be included in this study.

Faculty Activity Analysis forms also will be requested from staff whose prime responsibility is administration but who may also engage in teaching without having a budget allocation made from their administrative accounts to the academic departmental salary accounts. (e.g., Director of Computer Centre).

Payments made to students for graduate student support will be allocated to two activities--

(a) Payments made for assistantships will be allocated to Instruction as part of the undergraduate teaching activity.

(b) Payments made to students in excess of assistantships will ultimately be allocated to graduate program expenditures.

Expenditures on supervision of Post-Doctoral Fellows (P. D. F.'s) are considered to be research expenditures rather than instructional expenditures. Therefore, through the faculty activities analysis, these expenditures will be allocated to the University's research activity.

The operating expenditure budgets in each department will be reviewed prior to the application of the general allocation rules set out here so that any significant activity expenditures which can be directly related to a final activity will be included with that specific activity before general distributions are made. In this

regard, the expenditures of the academic vice-presidents and deans will be distributed only to the programs offered by departments within their respective divisions and Faculties.

Note: Step 1 accomplishes assignment of direct departmental expenses to their related activities. Step 2 redistributes the portion of these expenses that is assignable to other support activities and academic departments.

Phase II continued - Step 2: To distribute Activity Expenditures which are assignable to other Support Activities and academic departments

The support expenditures of Operations and Maintenance are assignable to other support departments and academic departments based on their actual space utilization. The accounting records reflect direct maintenance expenses attributable to each building in separate accounts. These expenditures will be allocated on a net assignable square feet (NASF) basis to the departments or activities utilizing the space in each building. Other maintenance expenditures which cannot be allocated to specific buildings or areas will be allocated in proportion to the assigned NASF relative to the total NASF of the University.

The cost of Academic Support Services includes direct expenses of the Computer Centre, Audio-Visual, etc., plus the allocated portion of Operations and Maintenance expenditures. These expenditures will be allocated to academic departments based on a statement of usage from each department. The expenditures on computer services associated with the administrative functions of the University will be allocated to those activities.

Instruction expenditures will be transferred directly to the academic department for which the expenditure was incurred.

Up to this point direct expenditures have been assigned to activities (Step 1) and the activity expenditures of instruction, academic support, and Operations and Maintenance have been redistributed (Step 2). In Phase III academic department expenditures are distributed to programs (Step 1) and support activities expenditures are distributed to programs (Step 2).

PHASE II: SYNTHESIS OF EXPENDITURES ON ACTIVITIES

STEP 2: To distribute activity expenditures which are assignable to other support activities and academic departments

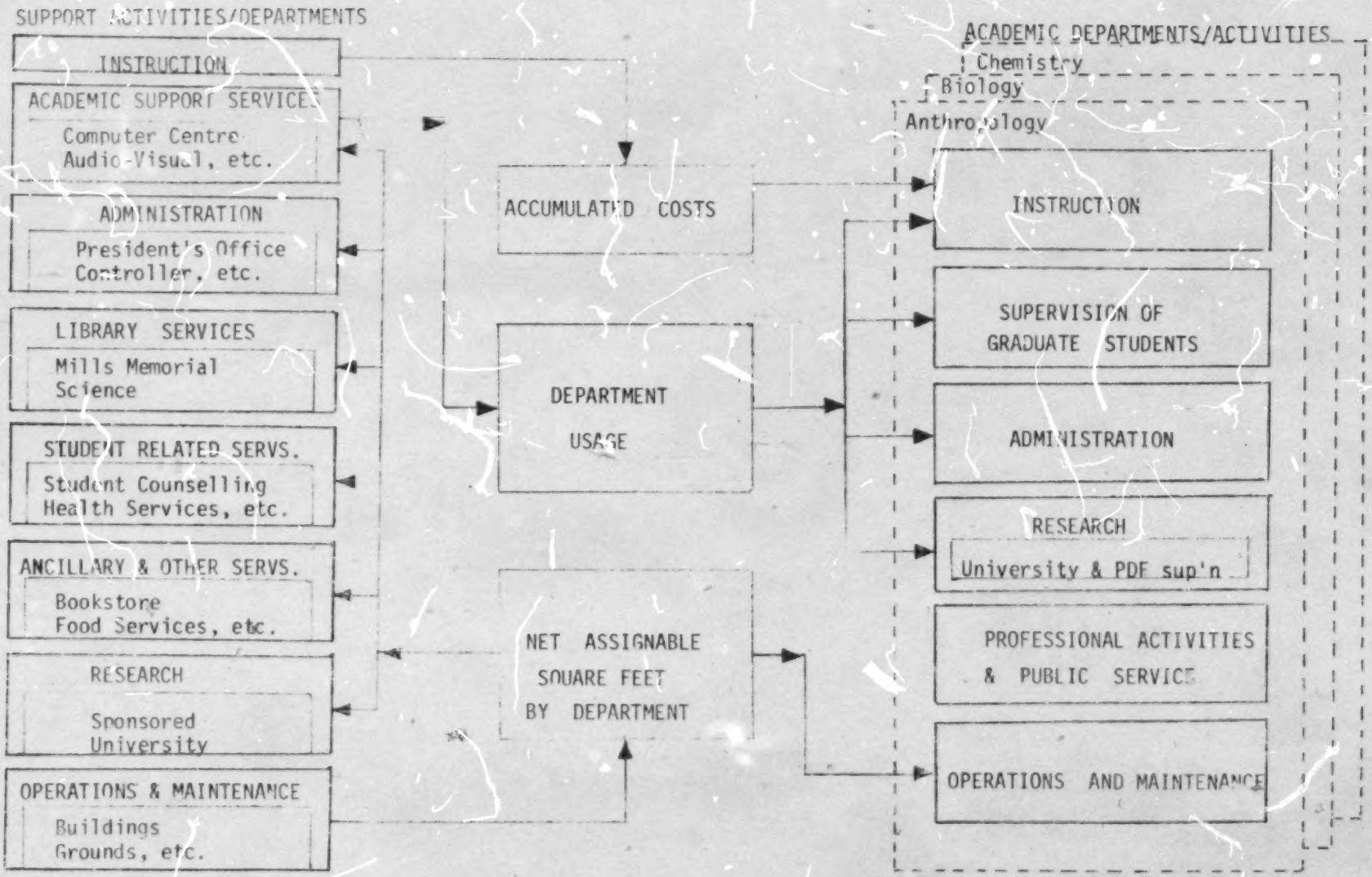


FIGURE 3

Phase III: Synthesis of Program Expenditures per Student--Step 1: To distribute academic department expenditures to programs and calculate expenditures per student

The purpose of this Phase is to distribute the activity expenditures of the academic and support departments to academic programs, departmental research, professional activities and public service.

Note: An internal distribution of direct expenditures based on faculty activity and direct assignment have been completed (see Phase II).

In this Step expenditures are distributed either on the basis of a program cross-over matrix or on the basis of program enrolment.

The data for these distribution bases are student oriented and will be obtained from the Office of the Registrar. Much of the required data are available from the Student Records Master File, and this will be extracted as at December, 1972.

The program cross-over matrix is actually an Instructional Workload Matrix (IWLM). The IWLM is a rectangular array of values expressing the number of student units generated in a given department by academic programs. (cf., pp. 45ff. in the 1971/72 OIR Fact Book --OIR 20). A detailed outline of the IWLM concept is presented in Appendix D. The IWLM will perform two functions in the expenditure analysis. First, it will convert student enrolments by academic program into workloads on departments. Second, the IWLM will provide a means of allocating departmental expenditures to academic programs.

The other distribution basis, program enrolment, consists of a student headcount by program in terms of student type (Undergraduate-Full time, Undergraduate-Part time, Graduate-Full time, etc.) and program year. The full time equivalent of the student headcounts, for distribution purposes, will be based on the student type.

The IWLM will be used to distribute those expenditures which vary in proportion to the workload (student units) generated in a department by academic programs. In this instance, instruction

PHASE III: SYNTHESIS OF PROGRAM EXPENDITURES PER STUDENT

STEP 1: To distribute academic department expenditures to programs and calculate expenditures per student

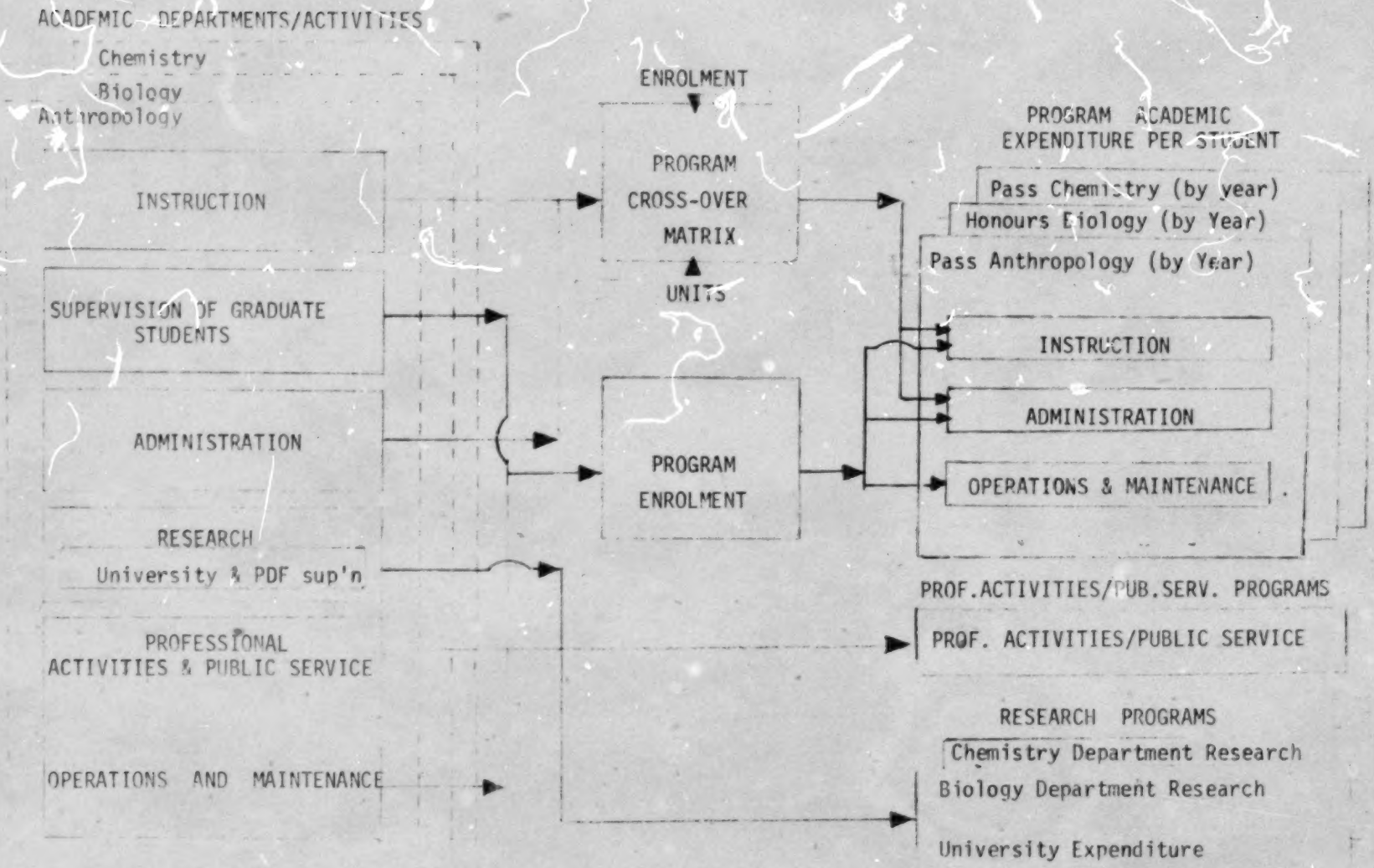


FIGURE 4

and academic administration costs will be allocated on this basis. The remaining expenditures, excluding research and professional activities/public service expenditures will be distributed on the basis of the FTE students taught by a department for each applicable academic program. University-funded research and professional activities/public service expenditures will be aggregated by department.

At the conclusion of this Step, academic expenditures per student may be calculated for each instructional department by program, (or in aggregate by all programs), and/or all instructional departments by academic program.

Phase III continued--Step 2: To distribute other Support Activities expenditures and finalize total program expenditures per student, and research and professional activities/public service expenditures by department

Expenditures on University Administration, Student Related Services, and Ancillary Service activities are dependent upon university enrolment. Therefore the costs associated with these activities will be allocated on the basis of total enrolment in each academic program.

Library expenditures will be distributed in two different ways in order to ascertain the sensitivity of program expenditure data to different assumptions about this complicated area. First, they will be distributed on the basis of program enrolment (see Figure 5). Second, they will be distributed on the basis of weighting factors (not shown in schematics). These factors will be based on the relative expenditures on programs using all expenditures except library expenditures. For example, if eight times as much is expended on PhD programs as is expended on pass undergraduate programs (excluding library expenditures), eight times as much library expense will be distributed to PhD programs as to pass undergraduate programs. The distribution to specific programs within a category--e.g., PhD in English vs. PhD in Physics--will be on a program enrolment basis. After the distribution of library expenditures is made in this way, total program expenditures will be calculated. The results of both procedures will be presented.

The support-activities expenditures allocations by academic programs will then be netted with the program academic expenditures to ascertain the total expenditure on each academic program. The program expenditure per student will then be calculated, based on the program enrolment.

PHASE III: SYNTHESIS OF PROGRAM EXPENDITURES PER STUDENT

STEP 2: To distribute other Support Activities expenditures and finalize Total program expenditures per student and research expends. by dept.

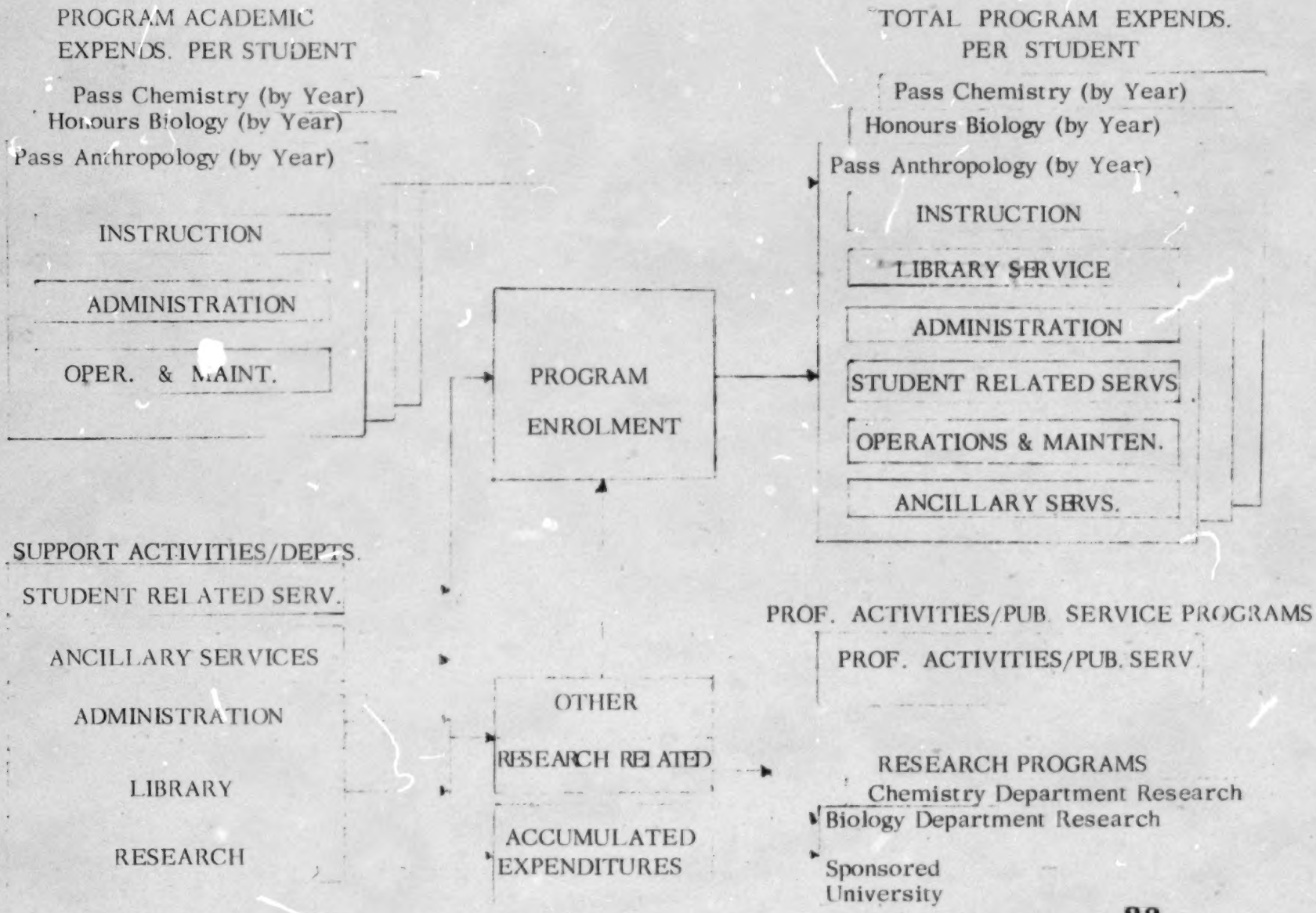


FIGURE 5

Research expenditures (university and sponsored) and professional activities/public service expenditures will be accumulated by academic department.

The methodology presented here describes the approach to be followed in the basic expenditure analysis. In addition to the basic analysis, a variety of sensitivity tests will be performed to ascertain the sensitivity of program expenditures to various allocation procedures. For example, the sensitivity of program expenditures to prorating secretarial time between instruction and research in proportion to faculty time in these areas vs. assigning all secretarial time to instruction will be tested. Such tests will facilitate an assessment of the variance of program expenditures resulting from using different analysis methodologies.

APPENDIX A

Definitions

Academic Programs.--For the analysis, an academic program is defined to be a program offered in one of the university calendars. Appendix E lists departments to be considered in the analysis.

Research Programs.--A basic principle underlying expenditure analysis by program is that a program is a self-contained micro system within an institution. Thus a given program often crosses organizational lines and includes bits and pieces of various organizational accounts. This concept forms the basis for defining instructional programs in the manner described above.

If this same principle were applied to research programs, all research in the University would have to be categorized into specific programs. That task might not be too difficult for research performed on a contract basis. But for research that is an integrated part of a scholar's creative activities, he will have enough difficulty separating it from other activities, much less categorizing it into specific programs.

In addition, research crosses organizational lines far less than instruction does--because instruction has a large cross-teaching aspect (e.g., engineering students take math, etc.), whereas research is often closely tied to a given organizational unit.

Therefore, for the purpose of this study, a research program is defined to be research by department. That is, research expenditures will be aggregated by department and reported at that level. For example, an expenditure will be reported for research in Applied Mathematics, another for research in History, etc. If research programs exist that involve large joint expenditures (by two or more departments) other than salaries (these will be split based on the distribution of faculty activity obtained from departments), allocation among departments will be made on an individual project basis.

Professional Activities and Public Service Programs. -- For the purpose of this analysis, professional activities and public service programs are defined to be all those activities falling within the definitions of professional activities and public service set forth in Appendix C and classified on a departmental basis. The rationale for classifying these programs on a departmental basis is similar to that set out for research programs--i.e., the difficulty in classifying such programs on an individual project basis and a minimum of inter departmental joint efforts involved. In this analysis only academic departments are assumed to participate in professional activities and public service programs . Therefore expenditures on professional activities and public service programs will be aggregated and reported on a departmental basis, in the same manner as expenditures for research programs.

By following such a procedure in this study, some guidelines may appear for further refinements in future studies.

APPENDIX B

Assignment of University Non-Academic Departments to Activities

Academic Administration

Graduate Studies Office
Offices of Academic Vice-Presidents
Offices of the Deans
Office of the Registrar (including Convocations & Examinations Liaison & Awards Secretariat for Senate & Faculty)

Academic Support Services

Audio-Visual
Computer Centre
Health Physics

Ancillary and Other Enterprises

Bookstore
Conference Office
Food Services
Non-Academic Sports
Parking
Printing Department
Residences

Library Services

Mills Memorial Library
Science and Engineering Library

Operations and Maintenance

Buildings Maintenance
Custodial Expense

Operations and Maintenance (cont'd)

Fringe Benefits--Supervisory Staff
Grounds
Maintenance Overhead
Motor Vehicle Pool
Office of Assistant Director--Operations & Maintenance
Office Services--Operations & Maintenance
Utilities

Research

CARED--University Cost
Nuclear Reactor & Accelerator
Sponsored Research

Student Related Services

Assistant to the President (Awards)
Dean of Men
Dean of Students
Dean of Women
Director of Drama
Enquiries Office
Overseas Students Advisor
Student Counselling
Student Health Services
Student Services General
University Scholarships

University Administration

Alumni Office
Business Office
Department of Information
Department of Publications
Development Fund Office
General Expenses
Office of Assistant Director of Construction
Office of Assistant Vice-President (Admin.)
Office of Director--Planning & Physical Plant
Office of Institutional Research
Office of the President
Office of Vice-President (Admin.)
Personnel Office
Post Office
Purchasing Department
Receiving and Stores
Security Force
Systems and Methods Department
Telecommunications

McMASTER UNIVERSITY FACULTY ACTIVITIES ANALYSIS

Definitions

Instruction. --"Instruction" is the total activity concerned with imparting knowledge through all forms of teaching activity. It includes: preparation of lectures, seminars and laboratories, including reading for this purpose; work with assistants, etc.; actual time spent in class, laboratories, tutorials, seminars, field work, organized visit, etc.; directing, advising, counselling, guiding and assisting students where these services pertain to a particular course; preparation of tests, examinations, marking of papers, essays, assignments, work with student professional societies, etc. (Undergraduate Counselling and Advisement).

Supervision.--"Supervision" is defined as all activities related to the direction and assistance given to graduate students and Post-Doctoral Fellows in their research and thesis work. The time allocated under this category should include the time spent on reading and evaluation of theses, and sitting on supervisory and examination committees, etc.

Research. --"Research" is broadly defined to include all those activities in which the University is engaged that may be described as scholarly investigation, experimentation or creative work. It includes the planning, coordination and execution of one's personal research projects and the preparation of related materials and all presentations of results.

Administration.--"Administration" consists of the planning, organizing, and directing functions performed which result in the formulation of policy and decision-making and the implementation of decisions. It includes those administrative functions that relate directly to departments, Faculties, Senate, Presidential Committees, etc. (e.g., staff recruitment, class scheduling, Faculty councils, etc.). It also includes time spent on Faculty Association matters.

Professional Activities.--"Professional Activities" refer to services related to inter-university activities, academic and professional organizations outside the University (regional, national and international)--including work done for learned societies, editorial and review work for academic journals and granting agencies, and

attendance at professional meetings. It does not, however, include the time spent on paid consulting activities.

Public Service.--"Public Service" refers to all activities that provide on behalf of the University a service to the community, to business, to governmental and non-governmental agencies for which no separate remuneration is received. This includes lectures and addresses to various non-academic bodies, advisory services, service on government committees, councils, etc. It does not include services incumbent upon a person as a result of his general responsibility in society (e.g., the United Appeal, School Boards, etc.).

McMASTER UNIVERSITY
FACULTY ACTIVITIES ANALYSIS

Information to be Supplied for the Period May 1, 19___ to April 30, 19___.

DEPARTMENT _____ FACULTY _____

CHAIRMAN _____ DATE COMPLETED _____

ACTIVITIES	Average % of Time[1]
1. INSTRUCTION	
Undergraduate Teaching and Scholarly Work Essential to it - First Year Courses	
- Second Year Courses	
- Third Year Courses	
- Fourth Year Courses	
Graduate Teaching Including Scholarly Work Essential to Preparation and Marking	
Undergraduate Counselling and Advisement	
Undergraduate Courses in Degree-Extension--Load	
2. SUPERVISION (Student Research and Thesis Work)	
Masters' Programs and First-Year Doctoral Programs	
Upper-Stage Doctoral Programs	
Post-Doctoral Fellows' Research	
3. RESEARCH, Scholarly Work and Creative Activities not Associated with Graduate Students or Post-Doctoral Fellows	
4. ADMINISTRATION AND COMMITTEE WORK (Internal)	
5. PROFESSIONAL ACTIVITIES (External)	
6. PUBLIC SERVICE	
TOTAL	100%

[1] Time should be distributed on the basis of an eleven month work year.

Time is defined as all time spent on behalf of the University as set out in the above categories.

APPENDIX D

Instructional Workload Matrix

The construction of an IWLM begins with the collection of course enrolment data for individual students classified by the academic program they have selected. Course enrolments are accumulated for these student segments and are expressed in unit values (enrolments times course units). For each academic program, the accumulation gives the total load created in all courses of every department of instruction. A combination of all course enrolments by academic program and department results in an Instructional Workload Matrix of unit values which compares one factor with the other. Academic programs are arranged horizontally and departments of instruction vertically, then reading down a column would give the total units created in each department by the academic program heading the column; and reading across a row would give the total units created by each academic program for the department beginning the row (see Figure 1).

FIGURE 1: Instructional Workload Matrix

	Program 1	Program 2	Program 3	Total Units by Department
Dept. A	400	500	650	1550
Dept. B	200	700	850	1750
Total Units by Program	600	1200	1500	3300

As an example of the way the IWLM will provide a means of allocating departmental expenditures to programs, consider the following:

If the total direct instruction costs for Dept. A and Dept. B. are 5000 and 6000 dollars respectively, then the direct instruction costs for the academic programs are computed as follows:

$$\text{Program 1} = \frac{400 \times 5000}{1550} + \frac{200 \times 6000}{1750} = 1976.04$$

$$\text{Program 2} = \frac{500 \times 5000}{1550} + \frac{700 \times 6000}{1750} = 4012.90$$

$$\text{Program 3} = \frac{650 \times 5000}{1550} + \frac{850 \times 6000}{1750} = 5011.06$$

APPENDIX E

Academic Departments Involved in the Study

Adult Education, School of
Applied Mathematics
Biochemistry
Biology
Chemical Engineering
Chemistry
Civil Engineering and Engineering Mechanics
Classics
Commerce
Economics
Electrical Engineering
Engineering Physics
English
Fine Arts
Geography
Geology
German
History
Mathematics
Mechanical Engineering
Metallurgy & Materials Science
Music
Philosophy
Physical Education
Physics
Political Science
Psychology
Religion
Romance Languages
Russian
Social Work, School of
Sociology and Anthropology